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SUMMARY REPORT OF TECHNICAL DISCUSSION

NASA-ERDA SOLAR ENERGY PROPOSAL
AT
DRYDEN FLIGHT RESEARCH CENTER (DFRC)
EDWARDS, CALIFORNIA

SUMMARY REPORT OF TECHNICAL DISCUSSION, NASA-ERDA SOLAR ENERGY PROPOSAL (Meckler (Gershon) Associates, Washington, D. C.)
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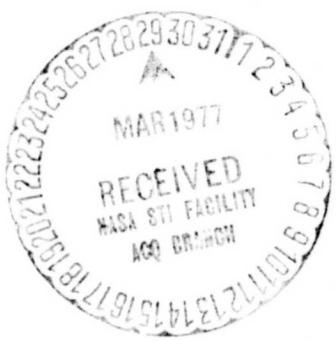

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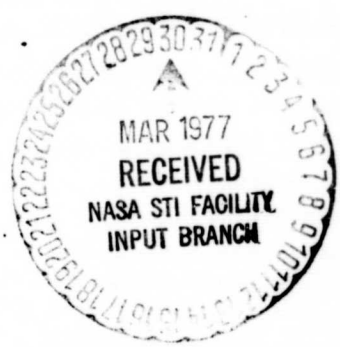

PREPARED BY

GERSHON MECKLER ASSOCIATES, P.C.

CONSULTING ENGINEERS

WASHINGTON, D.C.

AUG 10 1976

BXC

TO: Hugh L. Dryden Flight Research Center
Attn: FO/Energy Resources Manager

FROM: BXC/Director, Facilities Engineering and Maintenance Division

SUBJECT: Summary Report of Technical Discussion by Gershon Meckler Associates

Under the terms of the NASA Contract No. NASW-2920, this office received six copies of the "Summary Report of Technical Discussion NASA-ERDA Solar Energy Proposal," dated July 30, 1976.

We are transmitting two copies of the report for your review and analysis.

We are interested in your reaction to the Meckler analysis, and your comments will be appreciated.

Original signed
by
Gerald P. Gaffney
Gerald P. Gaffney

Enclosure

cc: (w/encl.)
BXD/Mr. John Madden
JHC-4/Mr. Martin Callahan
Mr. John Mockovciak (Grumman)

BXC/MAPagliuso:gpc:8/9/76:53114

Gershon Meckler Associates, P.C. • Consulting Engineers
1150 17th Street, N.W., Washington, D. C. 20036, (202) 296-5131

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August 25, 1976

Mr. Harold G. Napier
Director of Institutional Support Division
Dryden Flight Research Center
Code A
Box 273
Edwards, California 93523

Dear Mr. Napier:

Please find enclosed a copy of our recent Standard Form (SF) 254 which we are submitting to you in anticipation of your solicitation for A & E services with respect to the solar heating and cooling project at the Dryden Flight Research Center, Edwards, California. I am also enclosing a copy of our recent report that we prepared for NASA covering solar chemical dehumidification.

Our firm specializes in the field of solar energy design, energy conservation, utilization and management, and we are keenly interested in being considered for any A & E services associated with preparation of design documents for the construction of the proposed solar heating cooling system for Dryden Flight Research Center, Edwards, California.

If there is any additional information that you require, please contact us and we will be pleased to furnish additional information.

Very truly yours,

Gershon Meckler, P.E.

Enclosure

C.C.: Gerald P. Gaffney

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SUMMARY REPORT OF TECHNICAL DISCUSSION

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AT

DRYDEN FLIGHT RESEARCH CENTER (DFRC)

EDWARDS, CALIFORNIA

CONTRACT NO. NASW-2920

INTRODUCTION

In August 1974 Gershon Meckler Associates, P.C. (GMAPC) under a sub-contract with McKee-Berger-Mansueto under Task Order 21 (NASW-2356) prepared a study entitled "Evaluation of Solar Systems". This study presented a comparative evaluation of solar absorption cooling vs. solar chemical dehumidification for Building 4800, Dryden Flight Research Center, Edwards. This study indicated that solar chemical dehumidification was more efficient than solar abosrption. The study was based on 1973 building cooling load data given to Gershon Meckler Associates, P.C. (GMAPC) by Mike Groen (DFRC). The solar field area used for this study was 25,000 sq. ft. of flat plate collectors.

In August 1975 NASA-DFRC prepared a NASA-ERDA proposal for the design and installation of the solar chemical dehumidification system documented in our August 1974 study. During the interim period from August 1974 through April 1976 certain energy conservation measures to reduce the energy consumption have been implemented at the Dryden Flight Research Center. As a consequence of these energy conservation measures and the reduced building cooling load requirements for Building 4800, it was felt that a discussion of the NASA-ERDA Solar Proposal should be held at DFRC to assess the impact of the reduced energy requirements and cooling loads.

SUMMARY OF SOLAR ENERGY DISCUSSIONS AT MEETING HELD AT DFRC APRIL 8, 1974

Purpose: Review of Current Energy Conservation measures at Dryden Flight Research Center, Edwards and its impact on the pending NASA-ERDA Solar Chemical Dehumidification proposal.

Present:	**For NASA:**	Mr. Mike Groen	(Aerospace Engineer, Flight Operations)
		Mr. Joe Maetaes	(Division Chief of Facilities)
		Mr. Bruce Peterson	(Director of Safety)
		Mr. James McLaughlin	(Facilities Engineer)
		Mr. Gerald Gaffney	(Director of Facilities Engineering & Maintenance Div., NASA Headquarters)
	For Grumman Aerospace Corporation:	Mr. Tim [redacted] MURPHY	
		Mr. John Mockovciak	
	For Bechtold Satelite Technical Corporation:	Mr. Ira Bechtold	
		Mr. Randy Emerson	
	For Gershon Meckler Associates, P.C.:	Mr. Gershon Meckler	(President)

Mr. Mike Groen outlined the energy conservation measures that have been implemented at Dryden Flight Research Center, Edwards since the NASA-ERDA proposal for solar chemical dehumidification were prepared. Mr. Groen indicated that the energy conservation program at the Dryden Flight Research Center, Edwards had appreciably reduced the cooling of loads of many facilities including Building 4800.

Mr. Groen gave Gershon Meckler new cooling loads for the building which are substantially less than those used for the calculations in the GMAPC August 1974 study.

In light of the reduced cooling loads in Building 4800, it was suggested that a re-evaluation of the Solar Chemical Dehumidification System vs. Solar Absorption System be made based on the cooling loads established in the study of the Solar Absorption Refrigeration System prepared by Fred Dubin, since these cooling loads more nearly support the actual building cooling loads. Gershon Meckler agreed to prepare new calculations based on these loads, assess what impact that these reduced loads would have on the area of the solar collector field and the proposed solar chemical dehumidification system vs. the solar absorption system.

The purpose of the re-evaluation is to determine whether or not the size of the solar collector field could be reduced based on the reduced building cooling load and, if so, whether the solar chemical dehumidification system continues to be more energy efficient than the solar absorption system.

RE-EVALUATION OF SOLAR CHEMICAL DEHUMIDIFICATION SYSTEM VS. SOLAR ABSORPTION SYSTEM

Basis of Design

An analysis has been performed based on the following building cooling loads given to GMAPC by Mr. Mike Groen.

Month	Building Cooling Loads (Dubin Report)	1973 Cooling Loads (Meckler Report Dated 1974)
	BTU x 10^6	BTU x 10^6
5	188.00	600.00
6	231.00	850.00
7	270.00	1,100.00
8	259.00	1,050.00
9	223.00	950.00
10	189.00	550.00

Analysis and Conclusions

Table 1 (attached) has been revised to reflect the reduction of the building cooling load as well as a reduction from 25,500 sq ft to 12,000 sq ft of solar collector area. A review of Table 1 shows that the annual total building cooling load is 1360 x 10^6 BTU/YR. The total available solar energy for generating chilled water with the absorption chiller, operating at 200° inlet water temperature is 880.32 x 10^6 BTU/YR producing 589.82 x 10^6 BTU of chilled water. This system provides only 43% of net building cooling load requirements.

The solar chemical dehumidification process operating at 140° inlet temperature collects 1582.56 x 10^6 BTUs of useful solar energy producing 1376.83 x 10^6 BTUs of cooling. This system provides 100% of a net building cooling load.

This comparative analysis confirms that a solar collector field of 12,000 sq ft used in conjunction with the chemical dehumidification process can provide 100% of the cooling requirements for Building 4800, while the same size collector serving a solar absorption chiller will only provide 43% of the building cooling load requirements. The key factors contributing to the efficacy of the solar chemical dehumidification system are as follows:

1. The flat plate solar collector is approximately 80% more efficient operating at 140°F inlet water temperature as compared to operating at 200°F inlet water temperature.

2. The coefficient of performance of the solar chemical dehumidification process is 30% more efficient than the solar absorption chiller.

COMPARATIVE ENERGY ANALYSIS FOR SOLAR-LiBr ABSORPTION CHILLER SYSTEM VS. SOLAR CHEMICAL DEHUMIDIFICATION

FLIGHT RESEARCH CENTER, EDWARDS

		SOLAR ABSORPTION				SOLAR CHEM. DEHUMID		
MONTH	NET BLDG. COOLING LOAD BTU x 10^6	ENERGY INPUT REQ'D FOR ABSORP. BTU x 10^6 [Col.1 ÷ .67]	*SOLAR COLL FOR ABSORP PROCESS BTU x 10^6	CHILL WTR GENERATED BY SOLAR BTU x 10^6 [Col.3 x .67]	ADDITIONAL CHILL WTR REQUIRED BTU x 10^6	* SOLAR COLL FOR DEHUMID PROCESS BTU x 10^6	COOLING PRODUCED BY SOLAR DEHUMID BTU x 10^6 [.87 x Col.6]	NON SOLAR CHILL WTR REQUIRED BTU x 10^6
	Col. 1	Col. 2	Col. 3	Col. 4	Col. 5	Col. 6	Col. 7	Col. 8
1	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0
5	188.00	280.59	149.52	100.18	87.82	265.44	230.93	0
6	231.00	344.77	157.92	105.81	125.94	272.16	236.78	0
7	270.00	402.98	174.72	117.06	152.94	290.64	252.86	17.14
8	259.00	386.56	134.40	90.05	168.95	250.32	217.78	41.22
9	223.00	332.83	146.16	97.93	125.07	275.52	239.70	0
10	189.00	282.09	117.60	78.79	110.21	228.48	198.78	0
11	0	0	0	0	0		0	0
12	0	0	0	0	0		0	0
Total	1,360.00	2,029.82	880.32	589.82	770.18	1,582.56	1,376.83	58.36

* energy based on using 12,000 Sq.Ft. collector area
F E.W.T. for chemical dehumidification system (Col. 6)
F E.W.T. for absorption chiller system (Col. 3)

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